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On Younger Stakeholders and Decommissioning of Nuclear Facilities

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Authors: Bogumila Tyszkiewicz and Bea Labor
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This report concerns a study which has been conducted for the Swedish Radiation Safety Authority, SSM. The conclusions and viewpoints presented in the report are those of the author/authors and do not necessarily coincide with those of the SSM.

SSM perspective

Background

Nuclear power has not, at lest not yet, become the ultimate energy source predicted in the 1960´s. Its insufficiencies in this regard have been experienced and discovered throughout the years and questions has been raised on different issues such as par example capital cost, unclear productivity levels, doubts about reactor safety, risk of transporting nuclear fuel, lack of demonstrated systems for dismantling and depositing of nuclear waste. There is also a major concern about the generation of increasing amounts of plutonium which raises the issue of nuclear weapons proliferation.

In modern democratic countries, information sharing and effective and open communication concerning dismantling and decommissioning of of nuclear facilities as well as the management of nuclear waste are essential for the task to build the confidence required for any further development of nuclear energy. At the same time, it is often perceived that all decision making processes about nuclear energy policies are probably increasingly influenced by public opinion. Nuclear and radiation safety Authorities have a clear role in this regard to provide unbiased information on any health and safety related issues. In order to meet this need, it is necessary for Authorities and others to understand the values and opinions of the citizens, and especially the younger ones. They hold the key to the future at the same time as their perspective on these issues is the least understood.

The need of greater public participation in decision making is becoming increasingly recognised the scientific as well as the political community. Many activities are carried out in order to stimulate to higher levels of public involvement in decision making in this active research area. Younger citizens is a stakeholder group that is often excluded in decision-making processes. The existence of large gaps between the involvement of older and younger stakeholders in decision making processes needs to be addressed, since such imbalances might otherwise lead to unequal opportunities between generations and limit the future consumption level of the coming generations.

Another demanding task for the present generation is to assure that appropriate financial resources are injected into the Swedish Nuclear Waste Fund. It will thereby be possible for coming generations to undertake efficient measures in the decommissioning and dismantling of older nuclear facilities. To undertake such measures in line with the environmental and health codex is essential.

Purpose of the project

An appropriate balance in this regard must be based on a proper understanding of the values and value functions of younger citizens. Such information must thus be an integral part of the knowledge base to be used when plans and processes are being developed for dismantling and decommissioning of nuclear power plants and other older nuclear facilities.

In the present project, empirical data have been collected and compiled in a survey of the values of younger citizens with regard to decommissioning and dismantling of older nuclear facilities.

The survey constitutes a stratified sample from three towns in Poland. They are Lublin, Olsztyn and Gdansk. A total of 780 students in the age group 14-19 years participated in the Survey. The results are compared to those from a similar study in the County of Kalmar in Sweden in the year 2006.

Tentative Results

The results include some major lesson learned. These may be summarised as follows:

- Younger citizens tend to base their values regarding decommissioning on safety, and environmental aspects. Aspects like future economic growth and technological processes are less influential on the values.

- Younger citizens tend to express a lack of information and debate as a basis of their value functions. Likewise, they tend to express interest in the topic and are open to become more included in the processes.

- Younger citizens have suggestions on how more information can be made accessible to the general public.

- Younger citizens need to be better included in the stakeholder process. This can be achieved by allowances from the Swedish Nuclear Waste Fund to support groups of younger citizens to follow the Swedish process of research, development and demonstration of a concept for the management of spent nuclear fuel.

Less than fully accessible information campaigns about nuclear power and associated nuclear waste may result in differences in confidence levels

between different groups of stakeholders. By finding out more about the values of different stakeholders it will be possible for the Swedish Radiation Safety Authority as well as for Society as a whole to enhance the possibility to develop a model to incorporate the views of different groups of stakeholders in calculation of future decommissioning costs.

In this survey, steps are made to deepen and broaden the general knowledge of the values of one stakeholder group that will be more and more influential with time.

Continued work

Less than fully accessible information campaigns about nuclear power and associated nuclear waste may result in differences in confidence levels between different groups of stakeholders. By finding out more about the values of different stakeholders it will be possible for the Swedish Radiation Safety Authority as well as for Society as a whole to enhance the possibility to develop a model to incorporate the views of different groups of stakeholders in calculation of future decommissioning costs.

In this survey, steps are made to deepen and broaden the general knowledge of the values of one stakeholder group that will be more and more influential with time

Effects on SSM work

SSM will be able to use the study as supporting documentation in the review of the estimates given for the decommissioning costs of the nuclear facilities that are governed by the Financing Act. It can also be used as a supporting document in the cost control of disbursements to other governmental organisations as well as to non-governmental organisations.

Project information

Bogumila Tyszkiewicz and Bea Labor has performed the research task with determination and skill.

SSM reference: SSM 20081398.

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1. Brief Introduction to the Subject

It is assumed that a large numbers of research reactors, commercial nuclear power plants and other nuclear facilities utilizing radioactive materials will become candidates for decommissioning and dismantling up to year 2020. Some of these nuclear facilities are coming to the end of their financial as well as physical operating lives and will soon enter into the decommissioning phase. Common feature for these kinds of nuclear facilities is that there all where built, constructed and operated in many countries simultaneously in the early days of the nuclear era. Hence, the range and dimension extent of local nuclear experience varies widely. The dismantling and decommissioning of nuclear power plants, as well as other types of nuclear installations, are to a significant degree a linear function of the radiological risks due to ageing and other related issues, such as political considerations or environmental constraints.

This report focuses on democratic questions that need to be addressed from an open and accessible political process in order to achieve the full democratic potential in decommissioning projects. Hence, in this subject it is vital to find didactic techniques and methods to stimulate younger citizens to participate and be included in the process to plan for safely and efficiently decommission of reactors and other nuclear facilities.

For younger citizens there tends to be a profound interest for environmental questions. Some often occurring types of questions are described below.

- How can today´s society develop measures to support and guide the development of a decommissioning strategy that spur optimal use of available resources (and thereby reduce the future costs and constrains in the consumption of future generations)?

- How are methods and techniques that encourage and stimulate a timely and well planned decommissioning developed in an efficient, transparent and democratic manner? Thereby reducing the risks for delays in the decommissioning phase and in turn alleviating the accumulations of challenges which would demand increased expenditure and

specialist knowledge as the condition of facilities decays and deteriorates.

2. Decommissioning and Dismantling

There exist no absolute definitions per se of decommissioning and dismantling of nuclear power plants and other nuclear installations. To find a stringent and workable definition is a task that would be welcomed by professional as well as nonprofessional participants in the nuclear field. Nevertheless, there exist in principle two common strategic options for the decommissioning and dismantling of older nuclear facilities.

These are immediate dismantling, which sometimes is referred to as direct (or prompt) dismantling, and deferred dismantling. Sometimes there are references made to a third strategy called entombment.

Each of these three options may be found in different kind of steering documents, e.g. IAEA guidelines on decommissioning strategies. It is also possible to use strategies that are intermediate between these fundamental options, e.g. periodic dismantling on a longitudinal basis - that is over a longer time period as 30 to 50 years. Occasional, in some cases even time frames as long as 120 years has been used for planning. Such concepts may from time to time be suited to given situations: e.g. on a multi-facility site or in a country with unpredictable availability of resources.
However, regardless of which strategy is chosen in an authentic situation, for one or another reason, it is a prerequisite that characteristics from the local environment are used as a crucial and vital input to decide the optimum strategy.

In the rest of this document references will be given either immediate or deferred dismantling as defined in section 2.1 and 2.2 below.

2.1 Immediate dismantling

The immediate dismantling, or direct decommissioning and dismantling, strategy covers the situation where a nuclear facility is completely dismantled and decommissioned in the near future, e.g. between 2 to 15 years after the permanent shutdown on the specific nuclear site. It ought to be noted that this option is chosen when only limited benefits will be achieved from radioactive decay (normally decay of C 60 for one to two periods). This strategy imposes requirement for

prompt and immediately available funds, well developed planning and other needed financial resources.

2.2 Deferred dismantling

In this case the decommissioning and dismantling is deferred to a future date with an intervening period, a so-called transition period. A definition of the concept of transition period can be found in reference [10].

During the transition period surveillance and maintenance in order to guarantee a safe and risk-free mothball-period is needed. In some extreme cases the transition period can consume all available funds, and thus become the "standard" state since the resources for dismantling and decommissioning has been used to pay for the costs during the transition period. In this sense the deferred dismantling strategy is unsafe or risky. For older research reactors, as well as for nuclear facilities of smaller scale, this is usually equivalent to direct or prompt dismantling of accessible peripheral parts of the plant while leaving the activated parts, i.e. the reactor core, as a safe enclosure.

The deferral period is given either to allow the decay of shorter lived isotopes and/or until waste disposal facilities are in operation. It must be noted that extended periods of maintenance during the transition period may consume a lot, if not all, of segregated financial resources. The cost-drivers during the transition period can have different reasons, e.g. increased participation from the local community in the planning phase.

Inadequate financial funding may give rise to an automatic deferred dismantling by making all other opportunities financially impossible. Regardless of the length of the transition period, i.e. from the end of the operation to the beginning of the dismantling of the nuclear power plant, the requirements for safe conditions often demand immediately available financial assets as well as other more intangible actions. One example of such intangibles is the support and cooperation with the local society and the municipal organisation.

It may be appropriate to raise the question, already on this introductory level, that systematic surveillance and maintenance require continuous flows of funds during the transition period. The total cost of deferred dismantling can be on a higher level that the alternative of direct decommissioning and dismantling, even if the cash flow from time to time gives requirements that can give incitements to faster than planned dismantling. It is possible that the majority of the

costs can be deferred to a distant, and sometimes non-defined, future day. In this situation it is more or less crucial to stress that international accounting standards will have a financial impact on the pace of the process if future cash requirements are discounted. The positive benefit that the financial assets may have grown over time must be weighted against the other limited resources, such as municipal inclusion, knowledge of the plant and its condition, may degenerate over time. To fix a comprehensive setup of data for the alternative with deferred decommissioning and dismantling the length of the mothball period have to be integrated in a full SWOT-analysis that addresses the strengths, weaknesses, opportunities and treats of a deferral on a site-specific basis.

If the local municipal and its citizens are included in the process on an early stage it is possible to enhance the future process and give room for new, and maybe, today unseen opportunities. Early inclusion of all the stakeholders in principal, and the local community and its citizens in particular, is probably a prerequisite for a success in the process for dismantling nuclear power plants and nuclear facilities. Since deferred decommissioning and dismantling may consume time for between one half to over one generation it is in this case every so crucial to incorporate the younger citizens at an early stage in the process.

2.3 Entombment

The particular case when a nuclear power plant or nuclear facility is taken care of on the site is in most cases generally referred to as entombment.

This option is not appropriate to normal commercial power plants but may be attractive for some odd smaller nuclear facilities on grounds of simplicity and low costs. It ought to be said that this alternative not have been broadly used as a decommissioning strategy. It may be stated that the strategy of entombment was a viable decommissioning strategy in the early years of the nuclear era being practised in a few countries. But in reality the entombment approach often means that the problems is passed over to future generation and thereby violates the polluters' pays principle.

Entombment is perhaps suited where the older nuclear facility is situated in areas with low population density and far from populated localities. This approach may be applicable in an area where the geological and hydrological characteristics are suitable for building of a near surface repository and/or surface storage. In general, entombment may be a "forced-

upon" decommissioning strategy for countries that have the task to decommission a single facility and at the same time lacks financial assets, or are refused international aid and contributions, to develop the appropriate infrastructure needed to apply to international rules for transportation, as well as logistic constraints, for transportation of waste, definition of waste routes, waste handling and disposal of waste.

Likewise, as is the case in the previous situation with deferred decommissioning, the case of entombment calls for an early inclusion of the younger citizens in the process. This is due to the fact that this strategy might take a long time to implement and consequently is likely to have effects on the younger generation's future consumption of energy, goods and services.

3. How to Adopt a Decommissioning Strategy

Decommissioning strategies will vary according to a number of considerations. Hence, it is anticipated that the accessibility and availability of waste disposal routes, the quality of radiological mapping, the radiation protection policy, cost and funding considerations and local site factors are of most central importance to the process of defining opportunities for efficient decommissioning strategies in general.

In this context some pros and cons of key influences on the choice of decommissioning strategy needs to be revealed and presented at a first step. In this process of work it is essential to define the various resources required to achieve decommissioning. It ought to be stressed that there exist a close relationship between potential strategy options and availability and access to financial funding and opened resources. It may be stressed that it is customary to draw a clear distinction between short term resource requirements on one hand occurring soon after facility shutdown after the date when the last load of fuel has been reloaded, and on the other hand long term requirements relating to effects many years later. The latter types of requirements need special attention, since they are crucial for the quality of the planning in the first phase to present a decommissioning strategy. Likewise, short -term resources need to be available as well. However, since these resources normally are budgeted for in close connexion to the shutdown of the specific nuclear facilities this question may have a less critical impact in the longer perspective.

3.1 Inclusion of stakeholders

It is a well known fact that stakeholder relations are a potential factor for deviant project plans that jeopardise the timely delivery of a decommissioning project. There are many different stakeholders some of the more crucial ones are local municipalities, planning authorities, regulatory bodies, the public, 'pressure groups', environmental groups, anti-nuclear activists and other interested parties. One classic lesson learned from earlier decommissioning and dismantling projects is that early involvement of stakeholders in the project creates good working relationships and trust. If stakeholders are given access to the process and can participate in planning sessions with the project team a positive atmosphere of mutual trust and understanding may be created. By this step the working process will stimulate good and open communication to the public, which may give support for the chosen project approach. For a discussion of this process se for example reference [11 and 12].

The public may have had no awareness of the existence of a longstanding facility until decommissioning is announced. Public concern may suddenly be aroused if it is realized that the site may be used for storage of spent nuclear fuel or radioactive waste disposal.

3.2 Inclusion of younger stakeholders

As already mentioned the intrinsically nature of the projects of decommissioning and dismantling with its longitudinal base give rise for an early as possible inclusion of stakeholders in the process. The stakeholder in the local community is one of the major target groups for a successful planning and completion of projects that demands substantial support from the local community for successful implementation. The possibility to include the younger citizens at an early stage in the democratic decision making process of cooperation in environmental questions gives a unique possibility to gain commitment and support from a future group of stakeholders already today. Up to now this group has often been omitted from the open process since they lack a defined voice as well as an organizational identity and official clear status, or platform, for participation.

The use of this approach will make it possible to retrieve knowledge of different values of the younger population in this crucial and sustainable question. In a future step it will be possible to derive value function that in turn can be used to establish measures for inclusion of younger citizens in

a question that will be valid for many generations and centuries to come. In a longer time frame cooperation, and mutual interdependence in information exchange, with the younger generation may contribute to a more open and efficient democratic process regarding the work to construct, build and operate final storages for nuclear waste. The work to dismantle older nuclear power plants is not isolated to specific local areas within the European Union; instead it is a general question and ultimately a pan-European concern. This is due to the fact that radiological waste can contaminate other areas by mitigation of radio nuclides by land, air and water.

This will be achieved by reproducing the study made in Kalmar in 2006. The questionnaire has been developed by adding new questions, like for example questions about the preferences for different kinds of energy sources.

4. The background to the Study and Questionnaire for data collection

The primary objective of the project is to provide information so that it will be possible to describe and present authentic data about younger citizens values towards decommissioning and dismantling older nuclear facilities. By applying this approach it will be possible to retrieve knowledge about different values of the younger population in this crucial question.

Hence, based upon the retrieved survey data it will be possible to derive value functions of youths in this subject. This knowledge can be used to establish more comprehensive systems for inclusion of the younger citizens in a question that will be valid for many generations and centuries to come. In a longer perspective cooperation and mutual understanding, as well as potential support, from the younger generation may contribute to an efficient process of constructing and building underground storages for nuclear waste as well as the decontamination and dismantling of older nuclear power plants. This is not a question that is isolated to specific local areas within the European Union, but it will be a European concern.

This has been done by reproducing the survey made in Kalmar in year 2006. The questionnaire has in a first step been translated into Polish. In this process some of the questions have been adopted to Polish and European conditions. After in depth interviews with groups of students some questions were modified and some new questions were added to the

questionnaire. As an example one new question about the use of different energy sources was added to the questionnaire.

5. Model for Transparency

The task to inform the citizens about present as well as future risks of nuclear waste management is of strategic importance if the general public shall be able to develop a general trust for the nuclear energy as a long term viable energy source. In information activities concerning the risks linked to the use of nuclear technology there tends to be a misunderstanding, or less frankly described as a biased, to inform older priors to younger citizens. In order to support this statement we will refer to the risk and communication project (RISCOM).

The RISCOM project, and the development of the RISCOM model, has been financed within the European Commission fifth frame program. In this project a model for analysis of degree of transparency was developed in a smaller explorative study, a Pilot Project, funded by Swedish Nuclear Inspectorate and Swedish Radiation Protecting Agency. The aim of these projects and other similar projects has been to enhance transparency in the decision-making process in nuclear waste programmes. The aim was not only to increase the transparency in the process in the involved member countries but also within the European Union as a whole. The aim is to find ways and structures that can stimulate and foster enhanced degrees of inclusion of public participation.

In the RISCOM model different types of processes for public participation can be analysed, this enables in turn the development for more coherent and clear procedures for public communication.

The definition of transparency in this model has been developed to be as followed.

"*In a given policy area, transparency is the outcome of an ongoing learning process which increases all stakeholders appreciation of related issues and provides them with channels to stretch the implementer to meet their requirements for technical explanations, proof of authenticity, and legitimacy of actions. Transparency requires a regulator to act as guardian of process integrity*[1]".

[1] SKI, Structure for Transparency in Nuclear Waste Management, Comparative Review of the Structures for Nuclear Waste Management in France, Sweden and the UK, Raul Espejo, SKI Report 2003:26, November 2002, page 8.

In the democratic process there are important questions that ought to be addressed. Such questions may be stated as followed:

- *How shall the voice of the silent majority be included in the process in an open way?*

- *How may the Society be able to overcome the democratic deficits that relates to a specific policy issue like nuclear waste management in an appropriate way?*

From day to day we confronts as citizens with values and meanings produced and given to us by the operations of governmental institutions, commercial enterprises, multinational companies, pressure groups, support groups etc. As citizens we are evaluating all these values and information in ongoing and interactive processes by which we all create and develop considerations and alternative views. The lack of fully opened democratic processes and non-optimal interaction between different stakeholders can be described as a "democratic deficit". By drawing attention to the development of more appropriate communication channels, the society will be able to bridge the gaps between the silent majority vis-à-vis official appointed experts, official officers and politicians.

In this project we will concentrate the efforts to better understand the values and views of younger citizens in the decommissioning of nuclear facilities. This is a group that very often does not have any normal entrance to participate in the regular stakeholder processes. Their views are seldom seen as valid since they have not yet passed through the educational system and hence from this perspective tend to be seen as "not yet full educated and wise".

6. Different Levels of Inclusion

For structuring of the different types of influences to the creating of values it might be beneficial to define the main levels and the associated sources of influence. They are according to Dimmick and Coit (1982) for the media work as follows[2];

- Supra-national, e.g. international regulation agencies or multinational firms.
- Society, e.g. government or national social institutions like political parties.

[2] McQuail, Dennis, Mass Communication Theory, 4th edition, SAGE Publications, 2000, page 246-249.

- Media industry, e.g. competing media firms, advertisers, etc.
- Supra-organizational, like chains and conglomerates.
- Community, e.g. city, local business.
- Intra-organizational, e.g. groups or departments within an organisation.
- Individual, this is depending on role, social background, personal attitude, gender and ethnic origin.

If this scheme for analysis is applied on the stakeholder´s process it is seen that the possibility to participate in the process depends on the individual´s relations to the actual environment where unwritten social and cultural guidelines, habitué, must be obeyed.

The scheme also pinpoints the fact that a unique individual's access to the process via stakeholders groups is not to easy since there are many other more dominant levels. When the question of access to the transparent process is scrutinized in detail it will become evident that younger citizens[3], as well as citizens to come, have no natural base for participation in the process. In this perspective the younger citizens not only represent their own generations but also indirectly future generations. Due to this it is even more essential to include the values of younger citizens in present processes of decommissioning of nuclear facilities. To exclude the values of younger citizens in a selection process for choices for different decommissioning modes and strategies may give a biased decision process. This biased may ultimately result in that the decision makers of today are by working with models for stakeholders inclusions will not still have a clear model.

One step forward to develop new decision procedures that will enhance the democratic dimension is consequently to include younger citizens' values and value structures towards decommissioning of nuclear facilities in this kind of modelling.

7. The Aim of the Survey

The prime objective of this research project is to find knowledge that enables us to so provide so accurate information that it will be possible to describe and present authentic tentative data about younger citizen's values towards decommissioning and dismantling of nuclear facilities. The application of this approach will enable us to

[3] The values of younger citizens might be the best guesstimate for the values of coming, yet unborn, generations. From this perspective the younger citizens not only represent their own generations but also indirectly the future generations. Due to this fact it is even more essential to include the values of younger citizens in present processes of decommissioning of nuclear facilities.

retrieve knowledge of the different values of the younger population in a central and vital question that may have substantial impact on democratic processes. Thus, the task to develop a better understanding for value functions of younger citizens may enable the society to establish modes of better communication that includes the value of youths in decision processes in a question that will be valid for many centuries to come.

In a longer time perspective cooperation and mutual interdependence will be crucial activities for a successful dismantling process, as well as possible support that the younger generation may contribute to constructions of more transparent and open processes for decision-making in questions concerning handling of nuclear waste. Since the process to construct and build storage facilities for nuclear waste, like low and medium level wastes from dismantling, and decontamination and dismantling of older nuclear power plants not only are questions for specific local areas within the European Union. Hence it is essential that a pan-European perspective is applied already at the start of the process.

A secondary aim of this survey is the development of a questionnaire, and this can be seen as a method of development that in turn can be used to retrieve a more complete picture with corresponding data from other parts of the European Union of the values and attitudes among younger citizens. This approach can in turn contributed to a better understanding of the complex question of the value functions of younger citizens so that the question of biased in the transparency process can be corrected and even eliminated.

A third aim is that the result from the Kalmar sample can be examined and monitored concerning the validity and reliability of this survey.

8. Previous surveys – the Kalmar sample

The Regional Council in the County of Kalmar conducted in the fall of year 2006 a profound survey with a well developed questionnaire in four parts of the County. The study covered four municipals; they are Borgholm (on the isle Öland), Kalmar, Oskarshamn and Västervik. In the study a sample of a total of 235 youngsters in the age group 15 to 19 years were retrieved. The main raison d'être for this study was to compile increased knowledge

how younger citizens can be more included in the activities to build an underground storage for waste nuclear fuel in Sweden. The study was not done with particular focus on sample techniques, questionnaire formulation and analysis. It had the characterization of a typical explorative study, and it is stated that it is a miniature study from which it is not possible to make statistical inference. However, it is said in the short methodological part that the reliability as well as the validity of the study can be benchmarked by other similar, or explicative, studies. The main goal of the questionnaire was to find out how younger people can be stimulated to increase their propensity to participate and contribute in an active learning process about decommissioning of nuclear facilities.

In this document reference to the study made by the Regional Council in the County of Kalmar in year 2006 will be as the *Kalmar sample*.

9. The design of the present survey

The survey data has been collected on different locations the following dates and locations.

- In January and February 2008 in Gdansk.
- In September 2008 in Lublin
- In November 20008 in Elblag.

In the first part of the Study in depth interviews were conducted with the purpose to clarify if the questionnaire needed to be altered before the collection of survey-data started. In this process the questionnaire was used to retrieve information from the above mentioned stratified samples. The total of samples is 880 students. After the Survey the sampled data was coded and presented at working sessions in Gdansk in November and December 2008. In these working sessions ways to make the findings comparable to the findings from the Kalmar study were presented and discussed.

The Study has been divided into five different work packages (WP). These are as followed:

- **Working Package 1:** Identification, description and classification of the design of the study, with reference to literature. Definition of sample area and sample group to be used.
- **Working Package 2:** Preparation and execution of in depth interviews with the aim to

identify and include any local circumstances that needs to be taken into consideration in the design of the questionnaire.

- **Working Package 3:** Sampling of data by using the questionnaire from a stratified sample of approximately 880 students in Poland.
- **Working Package 4:** Analysis of the retrieved material including statistical presentation of the material and discussion of the results and lessons learned from the survey study. Including reflections concerning future tentative research and reasons for enlargement of the present study.
- **Working Package 5:** Production of the final report.

DATE OF SURVEY	SCHOOL	PLACE	NUMBER OF CLASS	NUMBER OF SURVEYS
2008-01-07	Zespol Szkol Lacznosci	Gdansk	8 classes	113
2008-01-09	Gim 7	Gdansk	2d	22
2008-01-10	Gim 7	Gdansk	3c, 3a, 3f, 2e, 3d	17 20 17 15 21
2008-01-30	Gim 7	Gdansk	2b	21
2008-02-05	8 LO	Gdansk	3e	25
2008-03-04	Gim 7	Gdansk	3b, 3e(mat-fiz)	19 28
2008-03-06	Gim 7	Gdansk	2a, 2c, 2f	17 23 10
2008-11-10	1 LO	Lublin	10 classes	285
2008-11-11				
2008-11-19	5 LO	Elblag	5 classes	127
			Total	**780**

City / Gender	Gdansk	Elbląg	Lublin	Total	%
Men	249	38	105	**392**	**50,3%**
Woman	119	89	180	**388**	**49,7%**
Total	**368**	**127**	**285**	**780**	**100,0%**

10. The Survey Data – An Descriptive Presentation of some Findings

In this section some of the major result and findings from the present survey study will be presented. To facilitate the understanding a comparison is made between the data retrieved from the survey in Poland vis-à-vis previous retried sampling data from the Survey in Kalmar mentioned earlier. It ought to be stressed that the results are presented question by question. Nevertheless, it must be stated that this report only contains presentation of the questions that has been given in the surveys done in both Sweden and Poland.

10.1 Question

Which form of energy do you prefer?

In the aggregated survey data a number of 780 students gave 1123 answers about the different alternatives on this multi answer question. In total approx. 35, 4% declared that they prefer windmills. Hydro power was said to be preferred by 32, 2% followed by nuclear power that was seen as a preferable energy source by 25, 2%. Energy produced by coal was seen as an acceptable alternative for 2, 8 % of the students.

If these data are compared to the Kalmar sample we can see a similar patter in the answers. The priority line is in both samples given as windmills, hydro energy, nuclear power and coal.

Some answers can be explained by fundamental differences in the energy balance in the two countries. In Sweden there are no priorities for coal, whilst 2, 8 % in the Polish sample preferred it. This reflects local differences which have to be normalised in the final results.

In Poland coal energy plants that are producing electricity are feeded with domestically produced coal. This has historically been a prime resource for energy that in the past has had a substantial contribution to the total energy balance. This has, on the other hand, never been the situation in Sweden.

10.1 Question 1

Which form of energy do you prefer?

City / Gender / Answer		Gdansk			Elbląg			Lublin			SubSUM Man	SubSUM Woman	Total	%
		Man	Woman	Total	Man	Woman	Total	Man	Woman	Total				
Coal	**M**	8		**8**	1		**1**			**0**	**9**		**31**	**2,8%**
	W		13	**13**		4	**4**		5	**5**		**22**		
Nuclear Power	**M**	72		**72**	18		**18**	78		**78**	**168**		**283**	**25,2%**
	W		19	**19**		16	**16**		80	**80**		**115**		
Hydro Power	**M**	106		**106**	16		**16**	60		**60**	**182**		**363**	**32,3%**
	W		44	**44**		40	**40**		97	**97**		**181**		
Windmills	**M**	111		**111**	21		**21**	52		**52**	**184**		**397**	**35,4%**
	W		61	**61**		53	**53**		99	**99**		**213**		
Misc.*	**M**	9		**9**			**0**	16		**16**	**25**		**49**	**4,4%**
	W		4	**4**		2	**2**		18	**18**		**24**		
Total		**297**	**137**	**447**	**56**	**113**	**171**	**206**	**299**	**505**	**568**	**555**	**1 123**	**100,0%**

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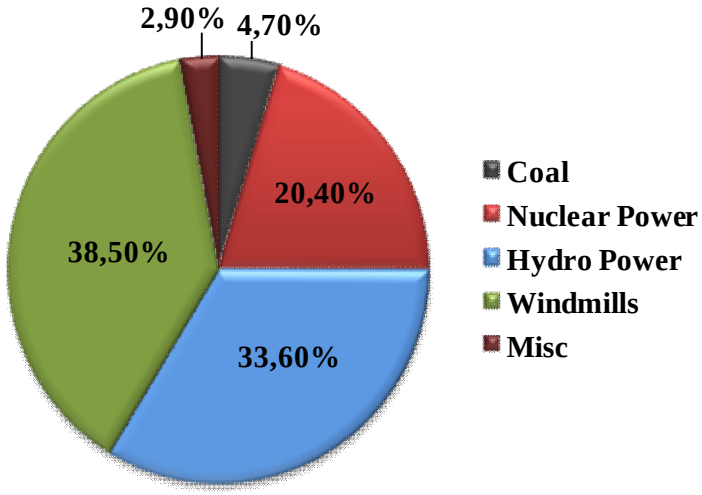

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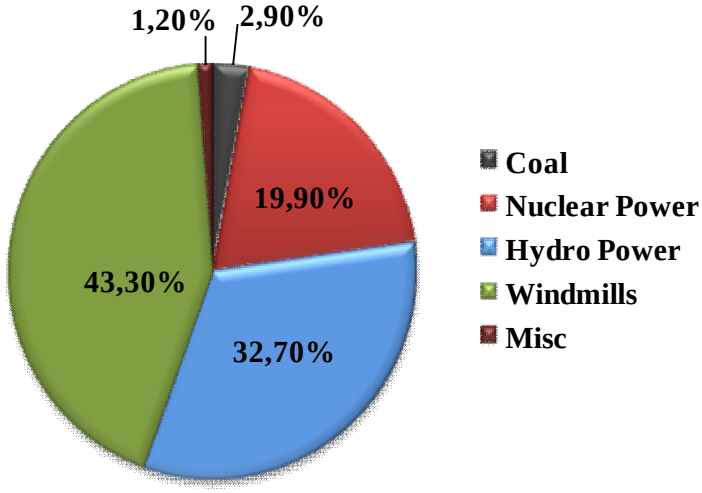

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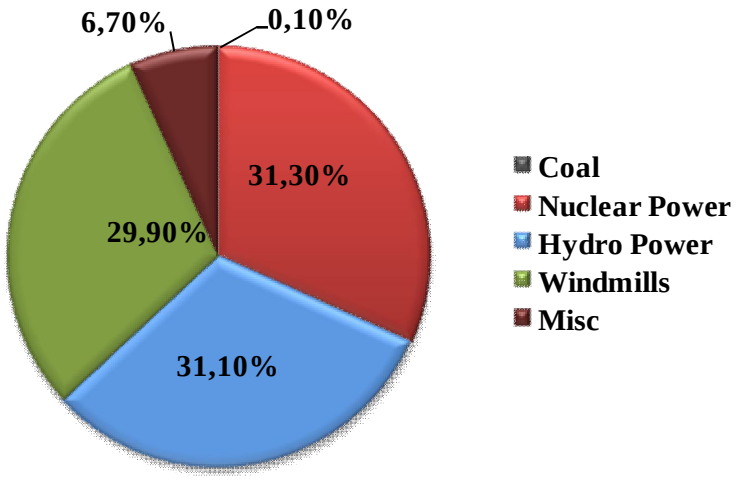

10.2 Question 2

Are you aware of that nuclear power produces not only electricity but also gives radioactive waste?

In the Polish sample a vast majority of 76, 4 % said that they know that nuclear power gives nuclear waste as a negative side-effect. On the other hand only a good 5, 3 % claimed to be unaware about this fact, while the rest, or 18, 3 % said that they were unsure.

In the Kalmar sample, on the other hand, nearly 69% said that they had this knowledge. Further, another 15, 9 % of the respondents said that they did not know that nuclear power producer nuclear waste, while the rest, or 15, 1 %, did not articulate any direct opinion in this question.

10.2 Question 2

Are you aware of that nuclear power produces not only electricity but also gives radioactive waste?

City		Gdansk			Elbląg			Lublin			SubSUM Man	SubSUM Woman	Total	%
Gender / Answer		Man	Woman	Total	Man	Woman	Total	Man	Woman	Total				
Yes	M	190		190	29		29	96		96	315		596	76,4%
	W		64	64		61	61		156	156		281		
Partial	M	44		44	8		8	5		5	57		143	18,3%
	W		43	43		23	23		20	20		86		
No	M	15		15	1		1	4		4	20		41	5,3%
	W		12	12		5	5		4	4		21		
Total		249	119	368	38	89	127	105	180	285	392	388	780	100,0%

10.3 Question 3

Do you know that nuclear power plants need to be dismantled after it has stopped producing electricity?

This question is linked to the previous question and since the linkages are strong it is appropriate to study the results from the two questions simultaneously.

In the Polish sample nearly 45% knew that the nuclear power plants need to be dismantled after they have stopped producing electricity.

When the answers given by the two groups are compared a similar pattern emerges. The amount of those who are aware of the fact that nuclear power generates nuclear waste is 76 % respectively 69 % for the two samples, which is not a statistical significant difference. Furthermore, concerning those students that claim that they were not aware of this, i.e. 5, 3 % in the Polish sample said that they did not know, compared with as much as 15, 1% in the Kalmar sample.

10.3 Question 3

Do you know that nuclear power plants need to be dismantled after it has stopped producing electricity?

City		Gdansk			Elbląg			Lublin			SubSUM Man	SubSUM Woman	Total	%
Gender / Answer		Man	Woman	Total	Man	Woman	Total	Man	Woman	Total				
Yes	M	107		107	20		20	50		50	177		345	44,3%
	W		55	55		37	37		76	76		168		
No	M	141		141	18		18	55		55	214		434	55,7%
	W		64	64		52	52		104	104		220		
Total		248	119	367	38	89	127	105	180	285	391	388	779	100,0%

10.4 Question 4

Are you aware of that nuclear waste is generating a hazard for health and nature for more than 100 000 years?

A number of 350 students, which is equal to 44, 9%, replied that they were aware that nuclear waste has negative effects to mankind for more than 100 000 years. Another 298, or 38, 2%, students said that they were unsure about the long-term health effects generated from nuclear waste. Finally a number of 132 students, which is equivalent to 16, 9%, gave the answer that they were uninformed of the risk.

As a comparison the waste majority (175/235), i.e. 74, 5%, in the Kalmar cluster sample said they knew that mankind is exposed to waste in more than 100 000 years. In the Polish sample the corresponding part is 44, 9 % or 350 out of 780 students answered that they knew that the negative effects has a very longitudinal and prolonged effect upon health and is a significant difference in the sampled data.

Thus, from the data it is possible to conclude that the overall awareness of the difficulties is significantly higher in the Kalmar sample than the Polish samples.

10.4 Question 4

Are you aware of that nuclear waste is generating a hazard for health and nature for more than 100 000 years?

City		Gdansk					Elbląg					Lublin					SubSUM Man	SubSUM Woman	Total	%
Gender / Answer		Man	Woman	Total		%	Man	Woman	Total		%	Man	Woman	Total		%				
Yes	M	91		91	142	38,6%	17		17	68	53,1%	53		53	140	49,3%	161		350	44,9%
	W		51	51				51	51				87	87				189		
Partial	M	102		102	149	40,5%	18		18	46	35,9%	36		36	103	36,3%	156		298	38,2%
	W		47	47				28	28				67	67				142		
No	M	56		56	77	20,9%	4		4	14	10,9%	15		15	41	14,4%	75		132	16,9%
	W		21	21				10	10				26	26				57		
Total		249	119	368	368	100,0%	39	89	128	128	100,0%	104	180	284	284	100,0%	392	388	780	100,0%

10.5 Question 5

Are you aware that Sweden is planning to store used nuclear fuel in rock caverns?

On this crucial and fundamental question about long-term preservation of high level nuclear fuel 635 out of 780 respondents, accounting for as much as 81, 4%, in the Polish sample said that they did not know anything of the Swedish plans to store spent nuclear fuel and/or other radiological waste steaming from nuclear activities in rock caverns in Sweden. On the other hand as few as 49 respondents out of 780, which are equal to 6, 3 % said that they had learned about the Swedish plans. Another one 1/8 of the sample, or 12, 3 %, gave the answer that they were unsure the Swedish plans. Hence, this implies that a somewhat higher percentage than 6, 3% may have received some information of the development in Sweden in this area.

In the Kalmar sample 160 out of 235, or 68 %, said that they are familiar with know about the plans. A whole 75 students, or 31, 2 %, was unsure or did not know about the plans.

When the results from the answers by the two groups of the cluster samples were compared, the conclusion was that it is significant that the level of knowledge is considerably higher in the Kalmar sample than the Polish samples. This is also what should be assumed. Nevertheless, there exist some observations of central importance to be given in this case. A consideration is given to a couple of the most obvious observations have been structured and formalised in the below two groups of questions.

1) Why is the information not spread from one Baltic region to another in this important topic? Why is there inertia in the exchange of knowledge in this field?

2) Why is, at the same time, a so high fraction as 1/3 of the Kalmar population unaware of the situation? Why have these students not been presented the following information?

3) It may be appropriate to stress that there are no significant differences between the three clusters that forms the Polish sample. This

fact is illustrated in the form of diagrams for the three different cluster areas, i.e. the samples of Gdansk, Elblag and Lublin.

10.5 Question 5

Are you aware that Sweden is planning to store used nuclear fuel in rock caverns?

City		Gdansk					Elbląg					Lublin					SubSUM Man	SubSUM Woman	Total	%
Gender / Answer		Man	Woman	Total		%	Man	Woman	Total		%	Man	Woman	Total		%				
Yes	M	21		21	31	8,4%	1		1	7	5,5%	7		7	11	3,9%	29		49	6,3%
	W		10	10				6	6				4	4				20		
Partial	M	24		24	43	11,7%	4		4	14	11,0%	13		13	39	13,7%	41		96	12,3%
	W		19	19				10	10				26	26				55		
No	M	204		204	294	79,9%	33		33	106	83,5%	85		85	235	82,5%	322		635	81,4%
	W		90	90				73	73				150	150				313		
Total		249	119	368	368	100,0%	38	89	127	127	100,0%	105	180	285	285	100,0%	392	388	780	100,0%

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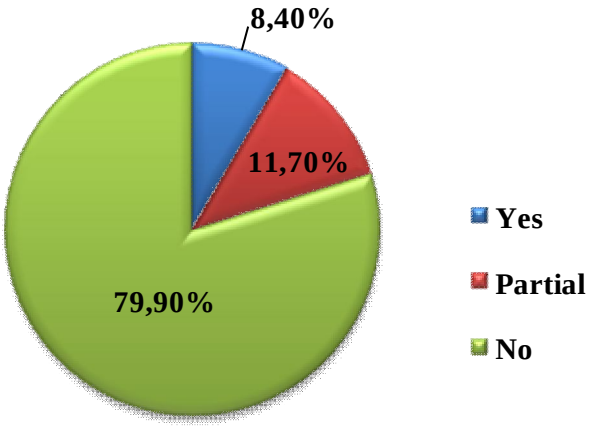

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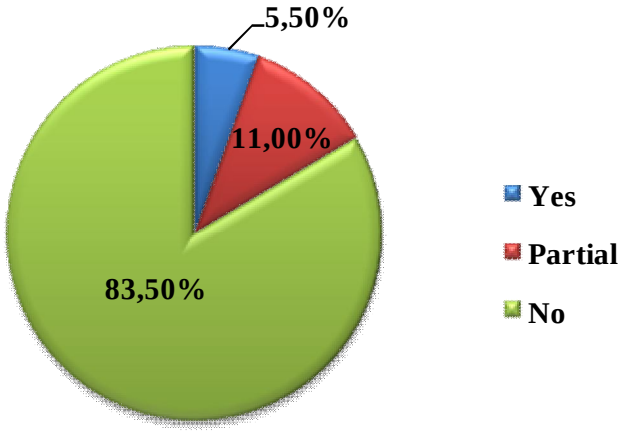

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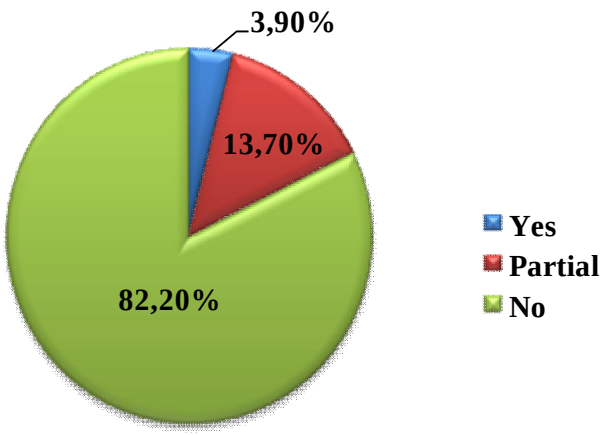


10.6 Question 6

Are you aware of that Sweden and Finland are planning to store used nuclear fuel and nuclear waste from the decommissioning of nuclear power plants in rock caverns?

The comments of this question are in principle very similar to those answers given to the previous presented question 5, with the difference that it is a two-folded question also includes the situation in Finland.

When the question is reformulated to a Yes/No question the results will be somewhat changed. In this case the changes are small and non-significant from a statistical point of view. This means that it may be possible to conclude that the result is fairly robust concerning the general common sense among younger citizens concerning long-term preservation of high-level nuclear fuel. In this case 666 out of 780, compared to 635 out of 780 on the previous question, of the responses in the Polish reflects that the knowledge level is low concerning the Swedish plans to store spent nuclear fuel and/or other radiological waste in rock caverns in Sweden.

Consequently, the rest nearly 1/6, or more precise 14, 6%, had some form of awareness of the Swedish plans. One interpretation is that a somewhat higher percentage than 6, 3% may have some information of the development in Sweden in this context, but the knowledge was not spelled enough to answer the question with a straight “yes”.

Again it can be stressed that when the results from the answers by the different cluster samples are compared one significant conclusion is that level of knowledge is somewhat higher in the Kalmar sample than in any of the three Polish samples

It may be appropriate to stress that there are some differences between the three clusters that together forms the Polish sample. This fact is illustrated in the form of diagrams for the three different cluster areas, i.e. the samples of Gdansk, Elblag and Lublin. It can be seen that the awareness of the fact that Sweden and Finland are planning for long-term storage of spent nuclear waste in rock caverns differs between

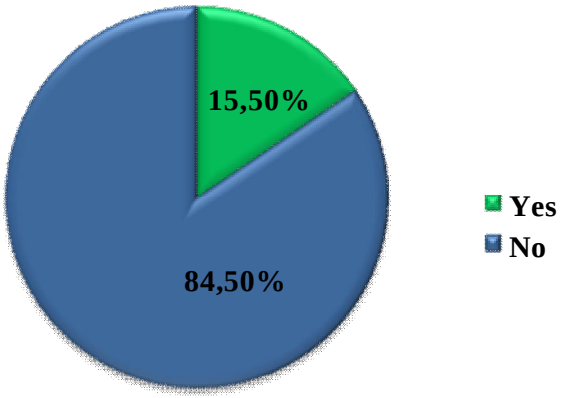
the Polish clusters. The awareness is higher in the northern clusters, with direct access to the Baltic Sea, compared with the south-east cluster in Lublin with its typical inland location.

10.6 Question 6

Are you aware of that Sweden and Finland are planning to store used nuclear fuel and nuclear waste from the decommissioning of nuclear power plants in rock caverns?

City		Gdansk					Elbląg					Lublin					Sub SUM Man	Sub SUM Woman	Total	%
Gender / Answer		Man	Woman	Total		%	Man	Woman	Total		%	Man	Woman	Total		%				
Yes	M	37		37			7		7			12		12			56			
	W		20	20	57	15,50%		25	25	32	25,20%		13	13	25	8,80%		58	114	14,60%
No	M	212		212			31		31			93		93			336			
	W		99	99	311	84,50%		64	64	95	74,80%		167	167	260	91,20%		330	666	85,40%
Total		249	119	368	368	100,00%	38	89	127	127	100,00%	105	180	285	285	100,00%	392	388	780	100,00%

GDANSK



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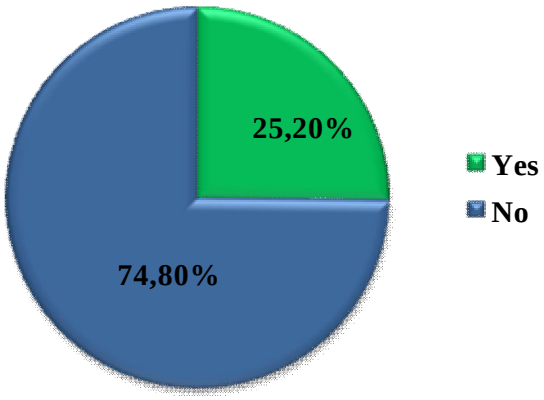

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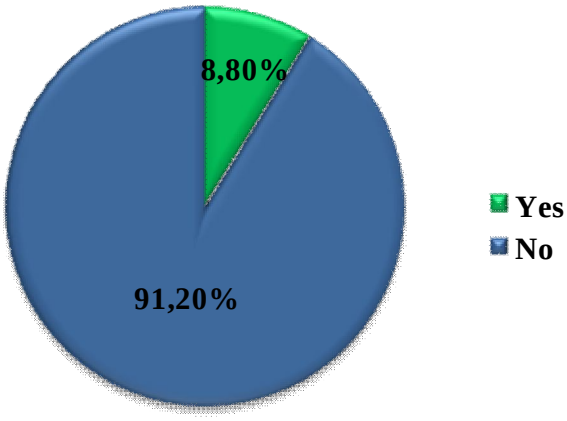


10.7 Question 7

Who shall take care of the Swedish nuclear waste?

A total of 692 of a total of 786 students, which is around 88%, answered that they thought that Sweden shall take care of the used nuclear fuel and nuclear waste from the Swedish nuclear program and the dismantling and decommissioning of the Swedish nuclear power plants.

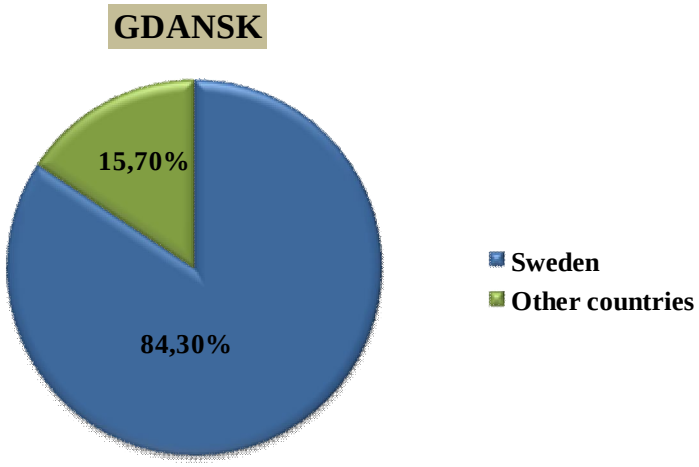
Consequently, a total of 94 students of a total of 786, which is equal to 12%, had the opinion that the nuclear waste generated in Sweden can be decommissioned not only by Sweden but also by other countries within the European Union. The conclusion is that although the waste majority of the bulk with the following opinion of the younger citizens is expressing a strict application of the subsidiary principle, i.e. the principle that says that the responsible polluter also shall take care of the pollution. The polluter pays principle seems to have a solid foundation within the intellectual framework of the younger citizens.

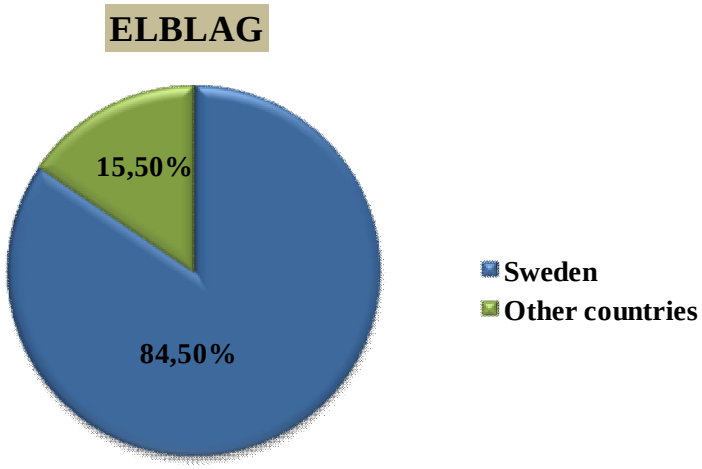
Again it is appropriate to highlight that there are significant differences between the three Polish clusters. This fact is illustrated in the forms of diagrams for the three different cluster areas, i.e. the samples of Gdansk, Elblag and Lublin. From these diagrams it can be derived that the view to apply to the subsidiary principle, or the polluter pays principle, is firmer in the southeast cluster in Lublin. Whilst, on the contrary, there seems to exist some traces of a non-linear thinking in the northern clusters. Once again there is a difference in the data material in the Polish clusters; and once again there is a significant difference in the views between the coasts versus inland locations.

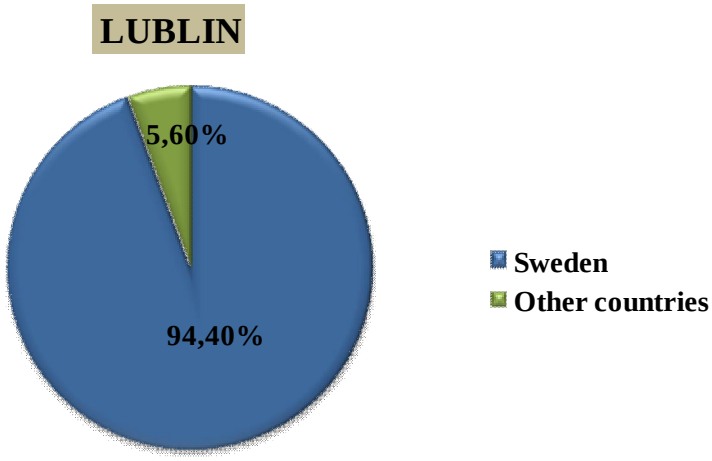
10.7 Question 7

Who shall take care of the Swedish nuclear waste?

City		Gdansk					Elbląg					Lublin					SubSUM Man	SubSUM Woman	Total	%
Gender / Answer		Man	Woman	Total		%	Man	Woman	Total		%	Man	Woman	Total		%				
Sweden	M	211		211	311	84,3%	36		36	109	84,5%	101		101	272	94,4%	348		692	88,0%
	W		100	100				73	73				171	171				344		
Other Contries	M	37		37	58	15,7%	4		4	20	15,5%	5		5	16	5,6%	46		94	12,0%
	W		21	21				16	16				11	11				48		
Total		248	121	369	369	100,0%	40	89	129	129	100,0%	106	182	288	288	100,0%	394	392	786	100,0%


GDANSK
15,70%
84,30%
Sweden
Other countries


ELBLAG
15,50%
84,50%
Sweden
Other countries


LUBLIN
5,60%
94,40%
Sweden
Other countries

10.8 Question 8

Where do you think nuclear waste shall be stored?

In the Polish sample most of the students representing 410 answers out of a total of 892 answers, which is equal to 46%, said that they preferred to store the nuclear waste in the space. Nearly as many, namely 339 answers out of a total of 892 answers accounting for 38% of total assume that rock caverns would be the most appropriate place. On the bottom of the sea was one options advocated by 3, 6 %, while another 7, 2% said that they preferred the Polar ice as a place for sustainable end-storage of nuclear waste.

The collected results from the Kalmar sample are in line with what has been derived from the Polish cluster samples. However, there are two minor differences that are appropriate to comment.

Firstly, a higher proportion in the Kalmar sample compared with the Polish cluster sample is in favour of sustainable end-storage in rock caverns and on the bottom of the sea. Secondly, in the Polish sample a higher than expected proportions of the answers are given the suggestion to store the nuclear waste in the space. In the Polish samples the alternatives of rock caverns vis-à-vis in the space are the opportunity storages that are favoured by most of the respondents. In the Kalmar sample the major answers are concentrated to the alternative to store the nuclear waste in rock caverns. This result may be explained by the fact that there is a rock laboratory located in the region.

10.8 Question 8

Where do you think nuclear waste shall be stored?

City		Gdansk					Elbląg					Lublin					SubSUM Man	SubSUM Woman	Total	%
Gender / Answer		Man	Woman	Total		%	Man	Woman	Total		%	Man	Woman	Total		%				
In the space	M	147		147	189	48,6%	18		18	52	38,8%	72		72	169	45,8%	237		410	46,0%
	W		42	42				34	34				97	97				173		
On the bottom of the sea	M	4		4	11	2,8%	1		1	6	4,5%	8		8	15	4,1%	13		32	3,6%
	W		7	7				5	5				7	7				19		
In the polare ice	M	17		17	23	5,9%	1		1	10	7,5%	12		12	31	8,4%	30		64	7,2%
	W		6	6				9	9				19	19				34		
In rock coverns	M	77		77	137	35,2%	16		16	56	41,8%	50		50	146	39,6%	143		339	38,0%
	W		60	60				40	40				96	96				196		
Misc.	M	17		17	29	7,5%	4		4	10	7,5%	3		3	8	2,2%	24		47	5,3%
	W		12	12				6	6				5	5				23		
Total		**262**	**127**	**389**	**389**	**100,0%**	**40**	**94**	**134**	**134**	**100,0%**	**145**	**224**	**369**	**369**	**100,0%**	**447**	**445**	**892**	**100,0%**

Answers given under the heading, Miscellaneous

1. *Nuclear Waste should not exist at all.*
2. *On another planet where no other forms of lives exists.*
3. *The researcher ought to invent something that makes the nuclear waste harmless to both people and environment.*
4. *One alternative is to find a way to deactivate the nuclear waste, so that it can be stored without any special demands on security.*
5. *The researchers should work to find new techniques to neutralise (de-contaminate) or reuse the nuclear waste.*
6. *In the rocks, but in geographical locations where the lands-cape is not exploited for use of mankind or animals.*
7. *My opinion is that it should be burnt or stored under the surface as waste.*
8. *But on a place where people do not walk.*
9. *The most appropriate measure ought to be a solution so that the waste does not pollute the environment or do not destroy the nature.*
10. *In such a way that the storage is not bothering other people.*
11. *In such way that it is not harmful to mankind.*
12. *In the same way as naphthalene is stored. In a way so that it will not harm other people (environment).*
13. *Should be neutralised (reprocessed) in one way or another.*
14. *If there would be no nuclear power plants there would be no radioactive waste as either.*
15. *Basically nuclear power plants should not be built at all.*
16. *It should be possible to construct rock caverns beyond the surface where the nuclear waste should be burnt, and the gases should be transported in an ecological way.*
17. *In special built rock caverns until it has lost its power, i.e. 100 000 years.*
18. *At another planet or in the space (satellite).*
19. *The best thing should be to reuse it.*
20. *Reprocess all of it (if it is possible).*
21. *Should be reprocessed and destroyed.*
22. *Reprocessed and vitrified.*

10.9 Question 9

Do you have confidence and trust in the decisions makers' capability in the de-commissioning process?

In the Polish cluster samples less than one fifth, or more precisely 17, 8% said that they have trust in the decision maker´s capabilities concerning their ability to solve the matter about how end storage for spent nuclear fuel and radioactive waste from decommission of nuclear power plants should be planned, constructed and operated. On the other hand one fourth, or exactly 25, 5% said that they mistrust the decision maker's capabilities in this context. The bulk of respondents representing more than the half (56, 7%) claimed that they did not have a clear position in this matter or were unsure.

The response from the Kalmar sample shows a similar pattern. Here a little more or 25 % said that they trust the decision makers and a little more than 50 % said they were unsure. Finally, an almost quarter said that they do not trust that the decision makers enough competence in this question.

It can be concluded that there appears to be a striking similarity in the answers given by the different cluster samples in Sweden respectively Poland. The somewhat higher response in favour of trust in the Kalmar sample is hard to explain.

At this stage it is appropriate to pinpoint that there are significant differences between the three Polish cluster samples. This fact is illustrated in the form of diagrams for the three different clusters, i.e. the samples of Gdansk, Elblag and Lublin. From these diagrams it can be derived that the opinion that decision makers have sufficient competences is firmer in southeast cluster in Lublin compared to the area of Gdansk and Elblag. Once again, it is important to emphasize that there is a

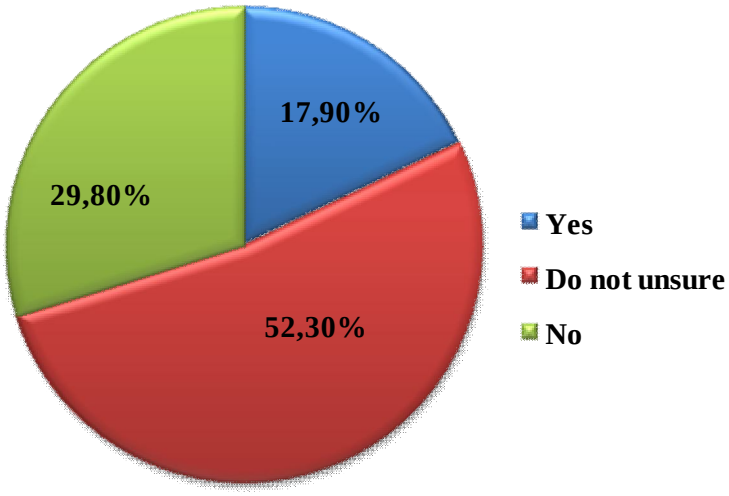
difference in the Polish clusters and that this significant difference in opinions have a divider between them in terms of the coast versus inland. The difference is significant from a pure statistical point of view, but shall not be exaggerated before extra data has been retrieved for the sole purpose of validating the robustness of the finding.

10.9 Question 9

Do you have confidence and trust in the decisions maker´s capability in the decommissioning process?

City		Gdansk					Elbląg					Lublin					SubSUM Man	SubSUM Woman	Total	%
Gender / Answer		M	W	Total		%	M	W	Total		%	M	W	Total		%				
Yes	M	37		37	66	17,9%	8		8	16	12,6%	34		34	57	20,0%	79		139	17,8%
	W		29	29				8	8				23	23				60		
Do not unsure	M	135		135	193	52,3%	19		19	75	59,1%	55		55	175	61,4%	209		443	56,7%
	W		58	58				56	56				120	120				234		
No	M	77		77	110	29,8%	11		11	36	28,3%	16		16	53	18,6%	104		199	25,5%
	W		33	33				25	25				37	37				95		
Total		**249**	**120**	**369**	**369**	**100,0%**	**38**	**89**	**127**	**127**	**100,0%**	**105**	**180**	**285**	**285**	**100,0%**	**392**	**389**	**781**	**100,0%**

GDANSK



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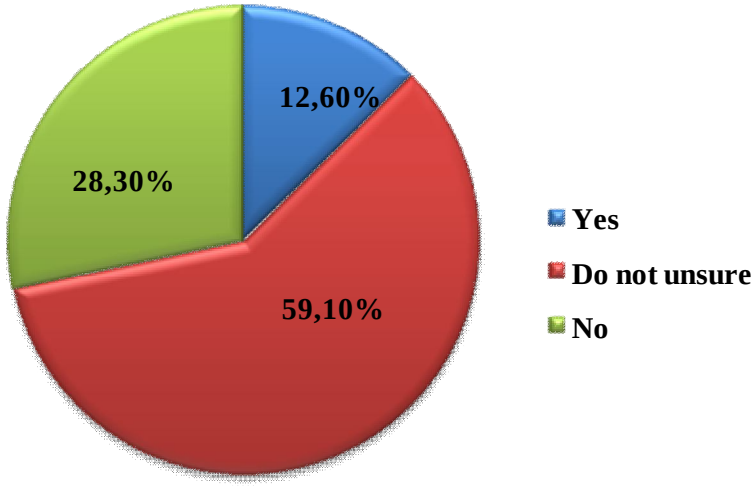

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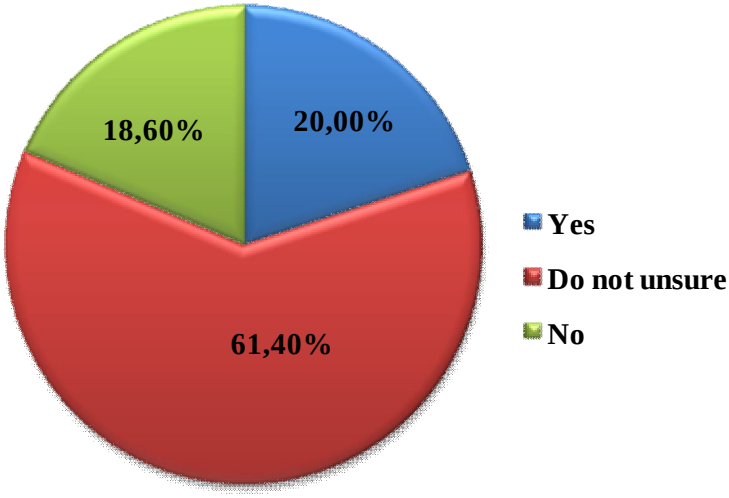


10.10 Question 10
Can you consider having a site for final disposal of nuclear waste near to your home?

In the Polish sample as little as 19,5 %, or 152 out of a total of 781 of the students said that they can consider a final disposal for nuclear waste from dismantling of older nuclear facilities be located near their homes. Consequently 80, 5 % of the respondents were against having a site for final disposal of nuclear waste in the surrounding vicinity of their homes and living space.

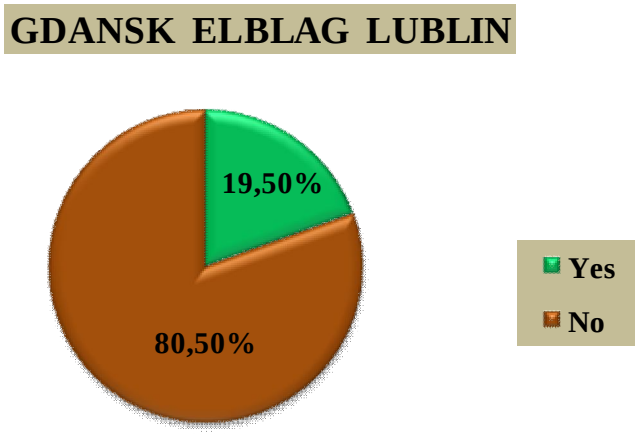
If these responses taken from the Polish samples are compared with the responses from the Kalmar sample it is again possible to find a striking similarity in the answers given. In the Kalmar sample 80, 9 % of the students said that they are against having a site for final disposal of nuclear waste in the surrounding area of their homes and living space.

There is in fact no difference statistically between the two populations in these questions. This means that we have fairly robust data to make a statement that younger citizens in general do not favour to have a site for nuclear waste from dismantling of older nuclear facilities in their neighbourhood.

10.10 Question 10

Can you consider having a site for final disposal of nuclear waste near to your home?

City		Gdansk			Elbląg			Lublin			SubSUM Man	SubSUM Woman	Total	%
Gender / Answer		Man	Woman	Total	Man	Woman	Total	Man	Woman	Total				
Yes	M	40		40	10		10	40		40	90		152	19,5%
	W		15	15		10	10		37	37		62		
No	M	210		210	28		28	65		65	303		629	80,5%
	W		104	104		79	79		143	143		326		
Total		250	119	369	38	89	127	105	180	285	393	388	781	100,0%



10.11 Question 11

What is your opinion regarding a site for final disposal of nuclear waste?

When the questions are reformulated and put in a more general form, e.g. without any reference to any geographical location, there tends to be a slightly stronger propensity to accept, or an increase in the acceptance level for a site for older nuclear waste. However, it ought to be stressed, that the acceptance levels is still in the boundary of one fifth to one fourth of the sampled data in general.

In the Polish samples it is recognised that as many as 25% of the answers given are in favour of a site for disposal of nuclear waste. Meanwhile it can be seen that roughly half of the answers 49.8 % (which represents 388 out of 779 answers) said that they were against it. As many as 196 out of 779, which represents approximately a quarter of the samples (25,2%) from the group sampled populations, did not express any preferences about this matter.

In the Kalmar sample as many as 44.3 % disclosed preferences in favour of a site for final disposal of nuclear waste and 29.4 % said that they were indifferent to the question.

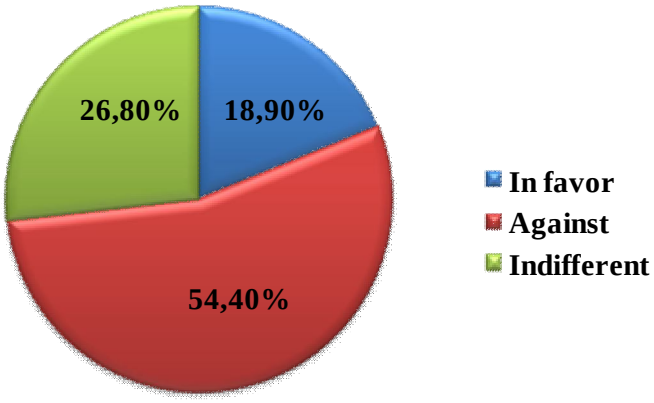
When the responses given by all samples are compared it is possible to see that the answers given by the subgroups that are negative are almost identical. The groups that declared they were indifferent to the subject are scattered within the interval of one fourth to one third. The difference in the material is that there are more positive students in the Kalmar sample as well as in the Lublin sample.

10.11 Question 11

What is your opinion towards a site for final disposal of nuclear waste?

City		Gdansk					Elbląg					Lublin					SubSUM Man	SubSUM Woman	Total	%
Gender / Answer		Man	Woman	Total		%	Man	Woman	Total		%	Man	Woman	Total		%				
In favour	M	48		48	69	18,9%	10		10	25	19,5%	54		54	101	35,4%	112		195	25,0%
	W		21	21				15	15				47	47				83		
Against	M	131		131	199	54,4%	16		16	67	52,3%	32		32	122	42,8%	179		388	49,8%
	W		68	68				51	51				90	90				209		
Indifferent	M	69		69	98	26,8%	12		12	36	28,1%	19		19	62	21,8%	100		196	25,2%
	W		29	29				24	24				43	43				96		
Total		248	118	366	366	100,0%	38	90	128	128	100,0%	105	180	285	285	100,0%	391	388	779	100,0%

GDANSK



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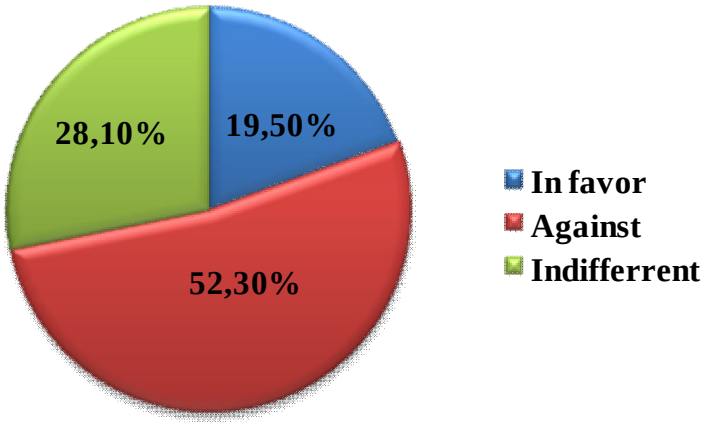

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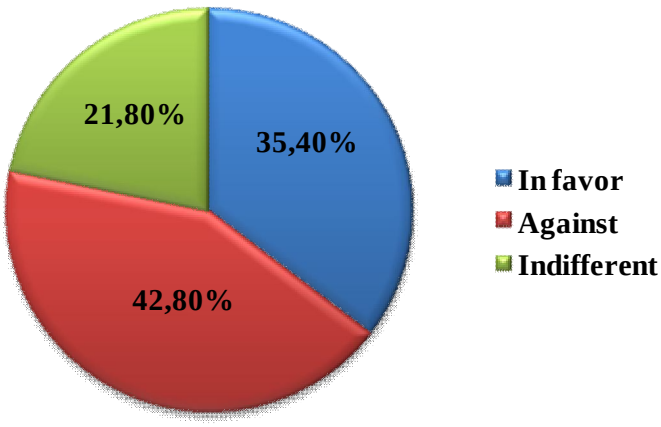

10.12 Question 12

Which of these values do you base your opinion upon?

In the Polish samples a total of 137 students out of 920, which is equal to 14,9%, expressed that their opionen was based on trust for the involved stakeholders. Another 11.7 % said that their opinon was based on the opportunities linked to major decommissioning projects. The second largest group, that in total accounts for as much as 38 % of the responses expressed that their opinions are based on unsufficient knowledge. In the major group as many as 38 % claimed that their opinion was grounded in uneasiness about the risks connected to decommissioning of nuclear facilities and storage, handling and management of nuclear waste. Finally, the smallest group with 56 out of 920 given responses, which account for 6,1 % of the total, gave other reasons for their opinion base.

In the Kalmar sample 21.7 % said that they based their opinion on trust for the involved stakeholders. This is a bit higher than the corresponding level of responses from the Polish samples. In the Kalmar sample another 15.2 % said that their opinion is based on opportunities linked to the project to build a final repository in Oskarshamn. These responses are on the same level as the responses given by the Polish samples. In the Kalmar sample 28.7 % said that their opinion was based on lack of knowledge, which is nearly identical to the Polish samples where 29,2% held this position. Finally, 31.1 % gave uneasiness about the risks connected to construction, building and operating of a final storage for spent nuclear fuel as the base for their values. This view is somewhat higher in the Polish samples where 38% expressed a similar view.

In the Kalmar sample 3.7 % of the answers were linked to other explanations, compared to 6,1% for the data from the Polish samples.

The sampled data gives that around two thirds of the younger citizens base their values on the risks connected to the handling of nuclear waste and lack of knowledge which can be interpretended in terms of a conservative approach towards the total risks.

The values bases includes also trust for the involved stakeholders that accounts for around one fifth to one sixth of the explanation as well as opportunities linked to a disposal of nuclear waste for around one tenth of the explanation value.

It may be possible from this data to give a tentative statement that younger citizens have their values based more towards fundamental questions concerning risks and lack of knowledge (information) compared to more opportunistic questions like future benefits to the region from a nuclear waste storage and trust for the stakeholders involved in the decision making process.

10.12 Question 12

Which of these values do you base your opinion upon?

City		Gdansk					Elbląg					Lublin					SubSUM Man	SubSUM Woman	Total	%
Gender / Answer		Man	Woman	Total		%	Man	Woman	Total		%	Man	Woman	Total		%				
Trust for the involved stakeholders	**M**	40		**40**	**56**	**13,6%**	3		**3**	**12**	**8,6%**	35		**35**	**69**	**18,8%**	**78**		**137**	**14,9%**
	W		16	**16**				9	**9**				34	**34**				**59**		
Opportunities linked to a disposal for nuclear waste	**M**	24		**24**	**31**	**7,5%**	9		**9**	**17**	**12,1%**	31		**31**	**60**	**16,3%**	**64**		**108**	**11,7%**
	W		7	**7**				8	**8**				29	**29**				**44**		
Lack of knowledge	**M**	86		**86**	**140**	**34,0%**	13		**13**	**41**	**29,3%**	21		**21**	**88**	**23,9%**	**120**		**269**	**29,2%**
	W		54	**54**				28	**28**				67	**67**				**149**		
Uneasy of the risks	**M**	111		**111**	**160**	**38,8%**	14		**14**	**65**	**46,4%**	32		**32**	**125**	**34,0%**	**157**		**350**	**38,0%**
	W		49	**49**				51	**51**				93	**93**				**193**		
Misc*	**M**	19		**19**	**25**	**6,1%**	4		**4**	**5**	**3,6%**	11		**11**	**26**	**7,1%**	**34**		**56**	**6,1%**
	W		6	**6**				1	**1**				15	**15**				**22**		
Total		**280**	**132**	**412**	**412**	**100,0%**	**43**	**97**	**140**	**140**	**100,0%**	**130**	**238**	**368**	**368**	**100,0%**	**453**	**467**	**920**	**100,0%**

10.13 Question 13

Which aspects are in your opinion crucial for the acceptance of a final disposal for nuclear waste?

In the Polish samples 442 answers out of a total of 1164 answers, which is equal to 38%, said that the safety aspect is the most important factor for considering in the decommissioning of nuclear waste. The environtal aspect was seen as the second most important factor with a total answer frequency of 26,5 % of all answers given. The third most important factor is that the localization of the disposal of nuclear and radioactive waste is as far from home as possible which was given in 254 answers out of a total of 1164 answers, hence accounted for 22.7 % of the total amount of given answers.

In the Polish sample these three reasons are as a combined an explanatory power of nearly seven eights, or more exactly 87,2%.

The rest of the reasons given for which aspects that have impact upon the acceptance of storage of nuclear waste may be lumped thogehter in two explaining factors. These are methods and techniques used (9,4%), economic growth or financial wealth (2,5%9) and other explanations (0,9%). The residual is of such a low magnitude that it may be overlooked.

If the findings from the Polish samples are compared with the findings from the Kalmar sample some similarities and differences in the given responses are evident.

Firstly and foremost, 37.7% of the answers from the Kalmar survey were explained by the safety aspect. This finding is in line with the findings presented in the Polish samples.

Secondly, the environmental aspect, to have the final disposal located in a remote place, was only seen as a

central aspect in 9.3 % of the cases in the Kalmar Survey. In the Polish samples this aspect has a explanatory factor in the region of ¼ (in the analyzed samples 26,5%).

10.13 Question 13

Which aspects is in your opinion crucial for the acceptance of a final disposal for nuclear waste?

City		Trójmiasto					Elbląg					Lublin					SubSUM Man	SubSUM Woman	Total	%
Gender / Answer		Man	Woman	Total		%	Man	Woman	Total		%	Man	Woman	Total		%				
Safety aspect	**M**	87		**87**	**92**	**37,1%**	26		**26**	**87**	**37,8%**	97		**97**	**263**	**38,3%**	**210**		**442**	**38,0%**
	W		5	**5**				61	**61**				166	**166**				**232**		
Environmental aspect	**M**	63		**63**	**65**	**26,2%**	17		**17**	**62**	**27,0%**	63		**63**	**182**	**26,5%**	**143**		**309**	**26,5%**
	W		2	**2**				45	**45**				119	**119**				**166**		
Location aspect, so far from home as possible	**M**	59		**59**	**64**	**25,8%**	14		**14**	**58**	**25,2%**	45		**45**	**142**	**20,7%**	**118**		**264**	**22,7%**
	W		5	**5**				44	**44**				97	**97**				**146**		
Methods and techniques	**M**	19		**19**	**19**	**7,7%**	9		**9**	**13**	**5,7%**	25		**25**	**77**	**11,2%**	**53**		**109**	**9,4%**
	W			**0**				4	**4**				52	**52**				**56**		
Economic growth	**M**	7		**7**	**7**	**2,8%**	6		**6**	**9**	**3,9%**	6		**6**	**13**	**1,9%**	**19**		**29**	**2,5%**
	W			**0**				3	**3**				7	**7**				**10**		
Misc.*	**M**	1		**1**	**1**	**0,4%**	1		**1**	**1**	**0,4%**	5		**5**	**9**	**1,3%**	**7**		**11**	**0,9%**
	W			**0**					**0**				4	**4**				**4**		
Total		**236**	**12**	**248**	**248**	**100,0%**	**73**	**157**	**230**	**230**	**100,0%**	**241**	**445**	**686**	**686**	**100,0%**	**550**	**614**	**1 164**	**100,0%**

Answers given under the heading, *Miscellaneous

1. *It is important that the managers who are responsible for the storage of nuclear waste a comprehensive and appropriate higher education. Also individuals that are responsible for the information and public relations must have a high education, since they have to communicate the risk about storage of nuclear waste to the public, who often only have limited knowledge about the subject.*

2. *I´m afraid that the people that work with the storage can make mistakes, due to this fact my opinion is that nuclear waste shall be stored at scarcely populated places.*

3. *The lowest possible risk for deteriation of human health.*

4. *It ought to be stored in a location where the impact for possible damage to mankind and the environment are minimized.*

5. *The storage of nuclear waste must be fortified for risk of war, and shall be safeguard so that an unplanned release of nuclear waste shall not poison different forms of life and affect the genetic code.*

6. *Should be distant from forests and villages and some major towns.*

10.14 Question 14

In which ways/forms do you think that younger people can participate and contribute to the information process about nuclear waste?

This question has multiple answers. In the three Polish samples from Gdansk, Elblag and Lublin a total of 1133 alternatives was ticked in the questionnaires. Please look below for a presentation of the suggestions that were given.

In the Polish cluster samples the respondents gave a lot of suggestions for possible improvements and developments concerning the shape and form of information in the area of decommissioning of nuclear power plants.

- It may be appropriate to notice that the alternative to participate in project groups (collective learning) was the most popular alternative that was suggested in 29.3% of the cases.
- The alternative of producing a film was mentioned as possible in as much as 18,9% of the cases.
- The suggestion to plan, organise and conduct exhibitions on the subject was given in 16,3% of the cases.
- The alterative to use IT and to create and construct websites was given in 14.7% of the case.
- The stricter fined suggestion to use „power point" presentations was suggested in 12.7 of the cases.
- The alternative to make a theatre play was ticked in 4,9% of the cases.
- Other suggestion was accounted for in 3,1% of the cases by given responses.

If a comparison is made with the responses from the Kalmar sample there is a striking similarities in the answers. In the Kalmar sample 24.8% of the responses suggested project work, „collective learning" and 16.6% suggested using exhibitions. Presentation by „power point" was given in 11.2% of the answers. To construct webpages and use IT was suggested as a measure in 12.9% of the cases. To put up a theatre play was suggested in 13.2% and film in

9.3% of the cases. Other alternatives were suggested in 11.8% of the cases, e.g. study trips and writing articles.

The main difference between the answers from the Kalmar sample compared to the Polish samples is that there is some variety concerning the use of theatre versus film as a media. Where the answers in the Kalmar sample was more in favour of using theatre as a media for expression viz-a-viz film. The opposite is true for the Polish samples.

In these guestions the similarities in the answers given by the Gdansk and Kalmar samples are close to each other. It ought to be remembered that the evaluation of the question is somewhat difficult due to the fact that it is a multiple response question and the number of responses given can be biased upon different things like instructions given, cultural reasons etc.

10.14 Question 14

In which ways/forms do you think that younger people can participate and contribute to the information process about nuclear waste?

City		Gdansk					Elbląg					Lublin					SubSUM Man	SubSUM Woman	Total	%
Gender / Answer		Man	Woman	Total		%	Man	Woman	Total		%	Man	Woman	Total		%				
Project work	**M**	55		**55**	**58**	**25,8%**	19		**19**	**62**	**26,7%**	71		**71**	**212**	**31,4%**	**145**		**332**	**29,3%**
	W		3	**3**				43	**43**				141	**141**				**187**		
Exhibitions	**M**	26		**26**	**31**	**13,8%**	7		**7**	**30**	**12,9%**	41		**41**	**124**	**18,3%**	**74**		**185**	**16,3%**
	W		5	**5**				23	**23**				83	**83**				**111**		
Power-Point presentation	**M**	28		**28**	**31**	**13,8%**	7		**7**	**25**	**10,8%**	32		**32**	**88**	**13,0%**	**67**		**144**	**12,7%**
	W		3	**3**				18	**18**				56	**56**				**77**		
Create web pages	**M**	29		**29**	**32**	**14,2%**	13		**13**	**42**	**18,1%**	39		**39**	**93**	**13,8%**	**81**		**167**	**14,7%**
	W		3	**3**				29	**29**				54	**54**				**86**		
Theatre	**M**	6		**6**	**7**	**3,1%**	4		**4**	**17**	**7,3%**	8		**8**	**32**	**4,7%**	**18**		**56**	**4,9%**
	W		1	**1**				13	**13**				24	**24**				**38**		
Film	**M**	58		**58**	**62**	**27,6%**	17		**17**	**53**	**22,8%**	28		**28**	**99**	**14,6%**	**103**		**214**	**18,9%**
	W		4	**4**				36	**36**				71	**71**				**111**		
Other*	**M**	4		**4**	**4**	**1,8%**	2		**2**	**3**	**1,3%**	13		**13**	**28**	**4,1%**	**19**		**35**	**3,1%**
	W			**0**				1	**1**				15	**15**				**16**		
Total		**206**	**19**	**225**	**225**	**100,0%**	**69**	**163**	**232**	**232**	**100,0%**	**232**	**444**	**676**	**676**	**100,0%**	**507**	**626**	**1 133**	**100,0%**

11. The Responses from the Survey

The qualities of the responses from the Polish cluster samples are similar in nature. There is also a similarity in the responses between the retrieved material in the Polish samples and the Kalmar sample. However it must be recognised that the latter sample is not designed to be adapted for statistical inference analysis.

Nevertheless, it is possible to find some critical similarities in the attitudes and values among the younger citizens in all samples. These similarities are advocated, articulated and expressed in the answers given by the respondents in the different stratified samples. These differences are, for the reason given concerning the Kalmar sample, not comparable in general from a pure statistical point of view.

11.1 The cluster samples and expected biased

The reasons for anticipated divergences between the different cluster samples can roughly be classified into three categories or groups. In the following section some remarks of these expected differences are presented more in detail. Furthermore, some tentative suggested explanation will be presented concerning the topic of expected "biased" or lack of biased in the material. The presentation is divided into three different parts. These are not always mutual exclusive, and may in some parts show signs to be partly interdependent.

1. *Quality in the responses due to differences in the construction of the Questionnaire (including linguistic differences).*

One evident example of difference in the quality of the responses is that questions in the Polish study seem to be more complex, and therefore are stricter defined. This may in conjunction with the fact that

the responsible person for the collection of the answers from the Polish samples gave a long introduction to the subject prior to the handling out of the Questionnaires be one valid explanation for some differences in given responses. It is also possible that this can have been influenced by the fact that there was an active participation during the time the students answered the Questionnaire. If students needed any help or assistance, personnel was present for individual talks with those who needed help and support. This procedure of data gathering may have contributed to a more fully fledge response to the Questionnaire, which in turn may partly explain some difference in the quality of responses as such. This seems to be particular true for the lower frequency of less appropriate responses, with ill relevant comments, given in the three Polish cluster samples compared to the Kalmar sample.

The basic Questionnaire used in the three Polish cluster samples done in Gdansk, Elblag and Lublin, is a development of the Questionnaire originally used in the Kalmar sample. The former have some more questions than the latter which can explain a part of the difference on the quality of the answers given. In this perspective it must be clarified that one of the aims of the present study was to develop the Questionnaire to be more adapted the authentic situation that faces a pan European audience.

When it comes to the question to validate the multiple response questions it ought to be pinpointed that the interpretation of these questions are more cumbersome and complex, which gives a somewhat higher degree of uncertainty in the coding and evaluation of the answers. In order to reduce this uncertainty more complete control about the authentic setting at the time of collection of the data is needed. One way to fulfil this demand can be to have the collection phase transcribed by use of video equipment.

The overall judgement is that the qualities of responses given in the three Polish cluster samples are of a good quality level. This makes it appropriate to use the gathered cluster data for making tentative statements about the value functions of younger European citizens towards decommissioning of older nuclear facilities.

2 Quality of the retrieved data, comparisons made and expected information gap between the Polish cluster samples and the Kalmar sample.

Sweden has during the latest two, or even three, decades worked extensively with operation of nuclear power plants as an integrated part of the Swedish energy infrastructure. At the same time some parallel work has likewise been done to find and define a concept for long-term storage of spent nuclear fuel elements. According to the original plans for the Swedish nuclear waste programme there should have been a number of storage facilities for nuclear waste in operation from year 2010. One of these facilities should have been designed to take care of the low and medium level (short-lived) nuclear waste from dismantling, whilst one other was designed to take care of long lived low and medium level nuclear waste.

It is therefore assumed that there should have been a higher knowledge base among the respondents from the Kalmar sample compared to the Gdansk sample in the current topic. If consideration also is taken to the fact that Sweden in the past has been a country with a high profile in environmental information questions and an early adapter to give financial transfers to non-governmental groups there is a historical tradition that would stimulate to a higher degree of inclusion of younger citizens. In the early days of the current survey study it was assumed that there should be a biased in the knowledge base in favour of the Kalmar sample.

After the survey had been done and the retrieved data had been analysed there was no evidence that suggested that there should be a biased in the knowledge base between the Polish samples and the Kalmar sample. This was a phenomenon that triggered for some a need for some extra time in the analytical phase. In spite of this extra analysis no appropriate explanation has been found that supports that there is no major difference in the information baser.

The only traces that hints towards a logical explanation can be found in the answers given on the question about the base for the viewpoint is that a vast majority of the respondents in both populations responded that they had lack of enough relevant information. If this is true, then there can be an explanation that the knowledge level of the Kalmar sample group has been overestimated due to the fact that it from the start of the project frankly was assumption that the information about nuclear waste handling and storage should be better in Kalmar than in Gdansk, Elblag and Lublin. One clear example here is that there is a lot of material with information about this topic, but the didactical quality and process may not be described as optimal. Another example is that the sample in the Kalmar Survey was concentrated on pupils from the last year in the compulsory Swedish educational system, whilst the Gdansk sample also includes students from the voluntary classes in the secondary grammar school (Gymnasium). Hence, the three Polish cluster sample has a somewhat higher average age. The maturity of the sample groups may have contributed to compensate for less information by a longer educational process.

Nevertheless, there is no major difference in the answers given by the three Polish samples compared with the Kalmar samples that in any way should suggests that the answers from the former groups should be less appropriate due to an informational gap. On the contrary, if the answers given are scrutinized it is clear that there are a high resembles, and the differ-

ence in the answers from the different samples do not indicate on any information gap. Consequently, this means that the answers given by the three Polish samples have at least the same validity and reliability as the answers from the Kalmar sample. Since the Polish survey data have more questions its coverage of the subject is both broader and deeper than the original Kalmar data.

3 Other Explanatory factors (institutional) that have effect upon the quality in the responses from the different cluster samples.

In the process to find explanatory variables to the answers given by the different sample groups an attempt has been made to find explanations why the similarity on the answers have a strong interdependence. In this process some tentative factors that may, or may not, contribute with an explanatory factor is listed. The following major reasons accounts for a high degree of the similarity in the answers given. These are:

- The question of energy consumption and energy balance has now been on the agenda for nearly two decades. The respondents in both groups have been fostered in a more environmental friendly time.

- Poland was one of the countries that were affected considerably by the effects from the major nuclear accident that occurred in Chernobyl in today's Ukraine. A consequence was that it was decided to mothball the Polish nuclear program. The first Polish commercial nuclear power plant that where under construction is located on the coastline just outside Gdansk.

- At present some parts of the political system have proposed the building of two nuclear reactors in Poland. One reactor is suggested to be built just outside Gdansk at the same location, and another reactor

is planned to be located to Poznan, alternative Lublin. The fact that the debate is ongoing may be an overall valid explanatory factor for the comprehensive knowledge in the Polish sample.

- It shall also be remembered that there may be a historical memory of the accident in Chernobyl in the Poland. These authentic facts may have contributed to a good knowledge base and interest about nuclear questions in Poland in general and perhaps even more in the Gdansk population. This was particular seen in the answers from the Lublin sample.

- In the Kalmar sample there may be an information inertia that explains the lack of difference in information level between the cluster samples. Hence, since there has been a nuclear power plant for 30 years in municipal of Oskarshamn in the south-east of Sweden and that Vattenfall AB´s daughter company SKB has conducted studies on the geological foundation in the area for many years this activities has become a part of the daily life[4].

11.2 The reasonableness of the overall quality of the responses from the cluster samples

The discussion in the preceding section 11.1 above has pointed out that the quality of the survey data is the same from all clusters. It must be stated that the quality level of the Kalmar samples seem to be of a somewhat lower quality. This impact is not of such a magnitude that it will have any major effect upon the tentative statements of younger stakeholder's value functions. In total this implies that we have not been able to find any biased in the material from the populations that in a significant way have can be antici-

[4] In June 2009 the Swedish Nuclear Waste Company, communicated that they has chosen the location in Forsmark as the first option for a waste storage for spent nuclear fuel.

pated to give influence on the sampled, coded and presented material.

Nevertheless, it shall be remembered that the aggregated number of responses are on the border for making predictability of younger citizen's value functions towards decommissioning of nuclear facilities. For this an aggregated cluster sample of about around 950 to 1200 respondents needs to be constructed.

However, the collected survey data is of such a high quality concerning the data from Gdansk, Elblag and Lublin that tentative hypothesis of the form of value functions of younger European citizens towards decommissioning of older nuclear facilities can be formalised.

12.Tentative Conclusions

In this concluding part of the report some tentative statements, or hypothesis, are presented concerning the form and structure of value functions of younger citizens towards decommissioning of nuclear facilities in a European perspective.

First it is appropriate to make a short recapitulation of the need for this kind of data, i.e. why is it essential to know something about the value function of younger citizens?

12.1 Is there a need for knowledge about younger citizens values and value functions?

The question concerning power production in general, and power production by nuclear power plants in particular, has been debated ever since the end of the second world war. The nuclear technique is a little more than 50 years old and there is no general consensus within the European community if nuclear energy should be used to produce commercial electricity on the Pan European deregulated market.

In Sweden the second reactor at the nuclear power plant in Barsebäck, in the south of Sweden and close to the city Malmö, was permanently closed in year 2004. The first reactor was closed as early as in 1999. The current Swedish case is that the dismantling of the nuclear power plant at Barsebäck is in a transition phase a waiting that a long-term storage for nuclear waste from dismantling will be taken into operation in Sweden. At present is anticipated that such a storage facility will be in operation in the beginning of the 2020´s. If it for example is assumed that storage for nuclear waste from dismantling will be in full operation in year 2024 this implies that the length of the transition phase is 25 years for the first reactor and 20 years for the second reactor. Hence, the length of the transition period, i.e. the time elapsed between the fi-

nal shutdown and the last day of the dismantling, is to be estimated to be one generation. This implies, in turn, that it will be the next generation that will be responsible to take care of the nuclear waste from dismantling.

Regardless of the standpoint of different stakeholders in the energy debate and the formulation of national domestic goals for energy production, consumption, strategy for energy balances and long term sustainability in a more environmental friendly community, it is of outmost importance to disclose the values of younger citizens towards decommissioning of nuclear facilities and handling of nuclear waste. The difference between nuclear power production and other energy production is the longer time span in the process of taking care of the rest products from nuclear power productions. This means that nuclear energy production has got costs in the so-called back-end, or down stream, in the production cycle that is more or less unsure. This is due to the fact that there is no system or method for long-term preservation in use in any part of the European Community.

One of the fundamental and visible parts of the commercial process to produce electricity from nuclear energy is the decommissioning of the physical buildings of nuclear facilities. These processes do not only contain major volumes of high, medium and low level waste, but this waste can be both short and long lived. Just the decommissioning of older, permanent shut-off, nuclear power plants can take a time span somewhere it the region of one half to 2 generations. This longitudinal character of the process gives rise to a need for finding and defining ways for an efficient planning cycle. This is also true for the actual operative work for dismantling these nuclear facilities. One crucial question in this perspective is how the society can include the younger citizens in the process already today, so that the knowledge base will be preserved between generations. In the envi-

ronmental codex in Europe it is perceived that the costs to take care of negative effects from environmental harmful activities shall be estimated and financial resources must be funded. This is demanded by the subsidiary principle that guards the property rights of future generations. This is sometimes referred to as the polluter pays principle; this principle states that the responsible part for the activity also shall take care of the negative effects in a prudent, efficient and trustworthy way. In the case of nuclear power production all the effects from the activities in the back-end takes a so long time that the effects are more or less uncountable.

In this process the younger citizens are, and will be, stakeholders for a long time. The future generations have to build a future energy system for a more unified Europe. In this perspective the question of decommissioning of nuclear facilities is one crucial question that is not only valid for specific countries, but also only one that cross the boarders of most member countries.

The context of this question and the strategies that lies before us demands that that there is a need to include younger citizens in today's processes to develop, facilitate and broaden the democratic dimension of a crucial and highly controversial part of the energy debate for many decades to come.

In order to make good and prudent costs estimations of the future costs to handle long term nuclear waste it is vital to develop and build accurate systems that can calculate the future costs for all activities in the back-end of the nuclear cycle with high precision. These works have to commence from the existing systems and models for cost assessments of liabilities from nuclear wastes. In this work one eminent starting point is to study if there is a biased in the calculations that steams from the fact that younger generations are not present in the process. Here, differences in value structures of generations may contribute to

enhance the both the accuracy in the estimated liabilities and the balances funded assets.

12.2 Younger citizens value functions

From the retrieved sample data from the Polish Survey that has been made by stratified samples from Gdansk, Elblag and Lublin, it is possible to formulate some tentative statements about the characteristics of younger European citizens value functions towards decommissioning of older nuclear facilities.

The main characteristics of younger citizens value functions can be described by the below presented statements. These are as followed:

- Younger citizens tends to favour long term sustainable energy sources, like e.g. hydropower and windmills, for limited techniques, like e.g. nuclear power and carbon based fossil fuels.

- Younger citizens tend to base their values for decommissioning on safety and environmental aspects. While other aspects like contribution to future economic growth in the society and development of technological processes are less influential on the values.

- Younger citizens tend to express a limited trust, or scepticism, concerning the capabilities of current decision makers to develop and present prudent, sound and long term sustainable handling of radiological wastes from decommissioning of nuclear facilities.

- Younger citizens tend to refer to a deficit of knowledge, information and debates as a basis for their values towards the decision makers skills, determination and credibility in this topic.

- Younger citizens tend to express interest in this context and are as such positive to become in-

cluded in the current processes in the field of nuclear waste preservation.

- Younger citizens can demonstrate major and well defined suggestions how more information can be accessible to the general public. They also tend to be able to present a wide spectrum of methods, ways and modes to include younger people in the topic and the related democratic processes. In the wide range of methods presented there are collective learning techniques, use of audiovisual tools as well as more traditional forms as handling of flyers and holding meetings. However, it ought to be remembered that also other modes of communications as making movies and theatre plays are part of the didactic base.

- Younger citizens have the propensity to prioritize aspects as safety and environmental questions above financial aspects and economic growth when it comes to decisions about the distribution and allocation of different sources of energy.

13 Lesson learned, future research - a concluding reflection

Within the defined area of this research project, for which we have received a research grant from the Swedish Radiation Safety Authority, we have been able to identify some general knowledge. This base may be appropriate to share with other researchers in the field.

There are also some areas for future research tasks that we have registered during this contemporary survey.

Finally, we would like to make some reflection of how younger citizens may be included as the stakeholders they actually are in the process of defining and develop systems for handling of spent nuclear fuel, handling of medium and low level waste and decommissioning of nuclear power plants (commercial or non-commercial plants).

13.1 Lesson learned from the project

One major experience is that it is possible to give the students rather complex questions. Hence, in this area there seems be no need for trying to find less complex questions, since the students demonstrated that they very well can answer complex questions in intelligent and trustworthy ways.

Furthermore, we also found that the number of in-depth interviews that were as a help to develop the original questionnaire from the Kalmar Study, could have been longer. However, it is advisable to enhance the interest and degree of participation of the students in an open interview and discussion to a motivator, like for example tickets to an event, concert or any kind of give-aways or vouchers.

During the Questionnaire collecting phase it was envisaged that a success in the data gathering are facilitated if the following things are met.

- A good cooperation with the chosen school and the chosen classes are a must. This is particularly important if a cluster sample is done.

- Before the handling out of the questionnaires a brief introduction to the topic and the aim of the survey must be presented by one of the researchers. Just to ask a school representative to handle out and collect the questionnaires will not give enough stimulation and mutual interaction in the data gathering phase.

It is also very important that at least one of the researchers is participating in handling out as well as collecting the questionnaires. It shall be mentioned that a physical appearance will automatically strength the motivation of the students to perform well. To be able to stimulate and motivate single students that need to have special attention, guidance or help to fill in the questionnaire should not be underestimated

13.2 Suggested future applied research

There are many research areas that are of vital importance to the future development of risk assessment, communication and inclusion of stakeholders values in longitudinal democratic processes.

Even if Sweden is generally seen as a good example on a well developed country in the field of nuclear waste preservation and enhancements there is still possibilities to find new ways to stimulate and motivate stakeholders to be more inclusive in the process. It is only by promoting transparency and public involvement that the democratic process can be secured and legitimated.

We have so far been able to identify the following areas for potential future applied research projects. These are:

- To develop a data base with survey data based on our questionnaire from the places within the European Union where co-operative decommissioning and dismantling are done of older nuclear facilities in Ignalina, Lithuania, Koztuduje, Bulgaria and Bohnice, Slovakia.

- To make a survey of communication and spread of information within the area of nuclear waste safety in Sweden. In this perspective it is essential to try to understand why the political active youth organisations do not apply for contributions from the Swedish Nuclear Waste Fund for stakeholder activities in the processes of communicating nuclear waste information with the younger part of the society.

- It is generally assumed that the future costs for decommissioning and dismantling of nuclear power plants, and its corresponding environmental liability, is heavily dependent upon the length of the total time to dismantle. From this perspective it is vital to give a correct estimate of the so-called transition period, i.e. the time between the point in time when the nuclear power plant has been permanently shutdown to the point in time when the decommissioning has been finished and the land restored for re-use. The length of the transition period can be seen as a substantial *cost driver*. The length of the transition period is much based upon the length of the democratic processes according to the environmental codex. Within this context an enclosure of younger citizens from participation in the stake- holder processes can be cost driving. Hence, in order to make an efficient and timely dismantling process it is good practise to incor-

porate the younger citizens at an early stage as soon as possible.

- There may be an overall biased in the cost calculation of the future costs for dismantling of older nuclear facilities and nuclear power plants. This biased may be corrected by adding a factor (scalar) for the length of the transition period. It may here be pointed out that the length of the transition period, as well as the potential prolonged dismantling process, may have a crucial impact on the calculation of the future *additional costs* that the Swedish Radiation Safety Authority makes on a regular basis. It is of outmost importance that this calculation is done based upon generation neutral assumptions.

  - In this survey there has not been any statistical significant deviation between the sexes. Hence, one hypothesis that needs further testing is that the values of younger citizens are genus neutral. This shall be compared to the general accepted knowledge for the older generations where the women have a higher risk preference than the males.

13.3 Ways to increase the inclusion of younger citizens in the process

One way to include younger citizens in the stakeholder process is to make an open and accessible platform for this group. Since the youth organisations, at least so far, has not engaged in the question about decommissioning of nuclear facilities, is seems to be appropriate to enhance the democratic dimension by reducing the obstacles for participations of youth organisations in the short run.

- One obvious measure is to include the youth organisations in the target groups for non-commercial

societies that can be given contributions from the Swedish Nuclear Waste Fund to follow the Swedish process to research, develop and demonstrate a concept for handling of the nuclear waste. From what has been presented in section 12.2 about the form of younger citizens values this will not be cumbersome if there is a clear strategy to include the younger citizens in the process. It is possible for the youth organisations to apply for contributions for this kind of activity already today. There seems to be some lack of good stringency in the system of nuclear waste information that has not reach this strategic and powerful stakeholder group.

- Another measure is to develop the didactic level of the information given to younger citizens by governmental agencies as well as the general energy companies.

- A final measure is to include the values of the younger citizens in the calculations of future cost for nuclear waste done by Swedish Nuclear Waste Company and the calculations of additional cost for future handling of nuclear waste done by Swedish Radiation Safety Agency. This can be done by either let some younger citizens participate in the so-called group of analysis. Thus the former is the route that which is recommended.

13.4 Un Petit Reflexion

The task to answer and fill-in a questionnaire has also as a side effect the role of a dialog between the older and younger generations. Just the fact that questions are given to the younger people works as a motivator for their future participation and inclusion in important and central democratic process, like for instance the question of handling of nuclear waste. Hence, the pure act to distribute and collect the questionnaires is in itself a measure to enhance and enlarge the awareness of the younger citizens.

We would like to conclude this report by reproducing some authentic responses in the survey by the younger audience.

- *This kind of questionnaires are essential, since younger people today has to take decisions about in the future tomorrow.*

- *I'm grateful that somebody wants to hear my voice and my opinion in this question.*

- *My view is that younger people´s opinions are important, since they have to take decisions in the future.*

- *According to my opinion this kind of questionnaires are very good because they give the younger people opportunity to be included and express their views.*

- *I feel that it is important to enlighten younger people so that they become knowledgeable about their future responsibilities.*

- *I think that it is very good that younger people got the possibility to participate in this kind of surveys. In two years time we will be mature and have to decide about our country. We must all be aware about what is going on.*

  - *My view is that these kinds of questionnaires are necessary if we shall be able to get information of the public view. The questions were of high standard and addressed the subject correct and precise.*

  - *In school we do not often discuss this kind of subject, so in this perspective this questionnaire was very important to us.*

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